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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/715,468	11/19/2003	Gan-Lin Hwang	0941-0869P	3761

2292 7590 05/21/2009
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EXAMINER

BERRIOS, JENNIFER A

ART UNIT	PAPER NUMBER
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1619

NOTIFICATION DATE	DELIVERY MODE
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05/21/2009

ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No. 10/715,468	Applicant(s) HWANG ET AL.	
	Examiner Jennifer A. Berrios	Art Unit 1619	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 18 June 2008.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-26 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-26 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 19 November 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Examiner has changed since the previous action, Examiner Jennifer Berríos will continue the prosecution of the application.

This Office Action is in response to Applicant's amendment/remarks/response filed 6/18/2008 wherein claims 1-2, 22 and 24 have been amended.

Objections Withdrawn

Applicants' arguments, filed 6/18/2008, have been fully considered but they are not deemed to be persuasive. Rejections and/or objections not reiterated from previous office actions are hereby withdrawn. The following rejections and/or objections are either reiterated or newly applied. They constitute the complete set presently being applied to the instant application.

Applicant's arguments with respect to claims 1-26 have been considered but are moot in view of the new ground(s) of rejection. The limitations of the newly added claims are different in breadth and scope, and therefore the rejections from the previous Office Action, mailed 3/18/2008, have been withdrawn.

1. Applicant's arguments with respect to the rejection under 35 USC 112 – 1st Paragraph have been considered but they are not persuasive. Claims 1-26 are rejected under 35 USC 112, first paragraph, because the specification while being enabling for a carbon nanocapsule thin film having a carboxyl group, does not reasonably provide enablement for any other functional group.

The rejection is maintained for reasons of record and the extension to all claims is necessitated by the claim amendment.

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Applicant argues that although the specification describes a carbon nanocapsule thin film having a carboxyl functional group, one of skill in the art understands that other functional groups can be added to the carbon nanocapsule. For example, US 2004/0126303 (in the name of the same inventor), an amine or quaternary ammonium group is bonded on the carbon nanocapsule by cycloaddition reaction and SO₄ is bonded by radical reaction. In response to applicant's arguments, examiner would like to point out that the US 2004/0126303 publication referenced by the application was published on 7/1/2004, one year after the filing date of the instant claims. As such one of ordinary skill in the art at the time the invention was made would not have had access to such information and bonding functional groups other than carboxyl to the nanocapsule would require undue experimentation.

Therefore, the rejection is maintained.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

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1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

4. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

5. Claims 1-7, 11-20 and 24-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakamoto (US 2002/0060514, pub date: 5/23/2002) and Hinokuma et al (US 2002/0187403, pub date: 12/12/2002, filed: 6/14/2002).

6. Nakamoto teaches a field emission cold cathode of a lateral type, a manufacturing method thereof, and a vacuum micro-device (Pg 1 [0003]). Under these circumstances, in a field emission cold cathode device of a lateral type and a vacuum micro-device using it, a device structure and a manufacturing method that can achieve low driving voltage, high emission efficiency, and a high integration degree are sought for (Pg 1 [0012]). Despite applicant's limitation of a nanocapsule, no difference is seen between the nanocapsule of the present invention and the nanotube of Nakamoto.

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7. Regarding claims 1, 5, 14 and 18, Nakamoto teaches a method of depositing fullerenes or carbon nanotubes onto a substrate by an electroplating process performed for about 4 minutes, the plating layers have a thickness of about 4 and 0.5 micrometers (Pg 5 [0071-0072]) and by an electroless plating process (Pg 5 [0064]). The electroplating process is further describes in Sheet 4, Figures 7A-C. As such it's expected that the process taught by Nakamoto results in a nanocapsule thin film.

8. Regarding claims 2-3 and 15-16, since the process described by Nakamoto is the same as the process claimed, then it's expected that the resulting product would have the same properties as those of the instant invention.

9. Regarding claims 4 and 17, during the plating process, the fullerenes or carbon nanotubes for forming the micro-bodies precipitated together with the plating material (Pg 5 [0072]). As such, it can be expected that a portion of the carbon nanocapsules are metal-filled.

10. Regarding claims 6-7 and 19-21, Nakamoto discloses an electroplating process having voltage sets at 100V, 10V and 0V (pg 5 [0071]). It would have been obvious to one of skill in the art to vary the potential of the external electrical field, especially since Nakamoto describes another embodiment with a driving voltage of about 7V (Pg 5 [0068]), considering that 6V is about 7V.

11. Regarding claims 13 and 26, it is required that the thin film comprise carbon nanocapsules in a range of 20-100% vol. It would have been obvious to one of skill in the art to adjust the plating solution (Pg 5 [0071]) composition which is precipitated with the carbon nanotubes desired, to achieve a desired result.

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12. Nakamoto fails to teach the carbon nanocapsule used to make the carbon nanocapsule thin film to comprise a functional group that carries at least one charge after dissociation.

13. Regarding claims 1, 11-12, 14 and 24-25, Hinokuma et al teaches a proton conductor that mainly contains a carbonaceous material, such as a fullerene derivative, a carbon cluster or a tubular carbonaceous derivative material (Abstract), which could include a carbon nanotube/nanocapsule. The proton conductor includes a proton conductor that at least has a number of functional groups so as to be capable of transferring hydrogen protons between functional groups of the conductor material (Pg 1 [0019]). The functional groups can be expressed by chemical formula $-XH$. In particular, the functional groups are preferably at least one of the $-OH$ and OSO_3H , and $-COOH$ (carboxyl), $-SO_3H$ and $-OPO(OH)_3$ functional groups. As defined by instant claims 12 and 25, a carboxyl functional group is a functional group that carries at least one charge after dissociation, specifically a negative charge.

14. It would have been prima facie obvious to one of ordinary skill in the art at the time the invention was made to combine the teaching of Nakamoto and Hinokuma et al, to arrive at the instant invention. One of skill in the art would have been motivated to add functional groups (such as $-COOH$) to the fullerenes and carbon nanotubes taught by Nakamoto, because Hinokuma teaches that using a proton conductor that has functional groups, lead to a proton conductor which exhibits a film formation ability, the thin film having a high strength, a gas permeation preventive or impermeable performance and good proton conductivity (Pg 1 [0020]). Finally one of skill in the art

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would expect to be successful because both teaching discuss the use of carbon nanotubes and fullerenes.

15. Claims 1-4, 9-12, 14-17 and 22-25 are rejected under 35 U.S.C. 103(a) as being obvious over Hwang (US 2004/0126303, filed: 6/27/2003) and Nakamoto (US 2002/0060514, pub date: 5/23/2002).

The applied reference has a common inventor with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art only under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 103(a) might be overcome by: (1) a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not an invention "by another"; (2) a showing of a date of invention for the claimed subject matter of the application which corresponds to subject matter disclosed but not claimed in the reference, prior to the effective U.S. filing date of the reference under 37 CFR 1.131; or (3) an oath or declaration under 37 CFR 1.130 stating that the application and reference are currently owned by the same party and that the inventor named in the application is the prior inventor under 35 U.S.C. 104, together with a terminal disclaimer in accordance with 37 CFR 1.321(c). This rejection might also be overcome by showing that the reference is disqualified under 35 U.S.C. 103(c) as prior art in a rejection under 35 U.S.C. 103(a). See MPEP § 706.02(l)(1) and § 706.02(l)(2).

16. Regarding claim 1, Nakamoto teaches a method of depositing fullerenes or carbon nanotubes onto a substrate by an electroplating process performed for about 4

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minutes, the plating layers have a thickness of about 4 and 0.5 micrometers (Pg 5 [0071-0072]). Nakamoto fails to teach the carbon nanotubes comprising a functional group.

17. Regarding claims 1-4, 9-12, 14-17 and 22-25, Hwang teaches a carbon nanocapsule is a polyhedral carbon cluster constituted by multiple graphite layers having a balls-within-a ball structure. The diameter of a carbon nanocapsule is about 3-100 nm. There are two types of carbon nanocapsules: hollow and metal-filled. The center of a hollow carbon nanocapsule is, of course, hollow, while that of a metal-filled nanocapsule is filled with metals, metal oxides, metal carbides, or alloys (Pg 1 [0004]). By functionalization of the carbon nanocapsule, at least one kind of functional group is bonded on the carbon nanocapsule, thereby increasing its reactivity. By functionalization with different functional groups, the reactive variety thereof is enriched, and thereby the application is expanded (Pg 1 [0012])

The carbon nanocapsules can be functionalized by a redox reaction, cycloaddition reaction, or a radical addition reaction (Pg 1 [0014]). After the redox reaction the functionalized nanocapsules are able to react with any other compound to form more complicated functionalized carbon nanocapsules (Pg 2, column 1, lines 1-7).

The organic functional group is selected from $-\text{OH}$, $-\text{CHO}$, or $-\text{COOH}$ and is functionalized by redox reaction (claim 10). Functional groups selected from $-\text{NHAr}$, amino group, among other, are functionalized by cycloaddition reaction (claim 15).

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18. Hwang fails to teach the use of these functionalized carbon nanocapsules to form a carbon nanocapsule thin film prepared by electroplating a plurality of carbon nanocapsules onto a substrate.

19. It would have been prima facie obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Hwang and Nakamoto to arrive at the instant invention. One of skill in the art would have been motivated to use the electroplating process described by Nakamoto with the carbon nanocapsules described by Hwang because, Hwang teaches that by bonding at least one functional group on the carbon nanocapsule, it's reactivity is increased and thus it's application/uses is expanded (pg 1 [0012]).

Conclusion

No claims are allowable.

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

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the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jennifer A. Berríos whose telephone number is (571)270-7679. The examiner can normally be reached on Monday-Thursday: 7:00am-4:00pm (EST).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Woodward can be reached on (571) 272-8373. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

JB

/MP WOODWARD/
Supervisory Patent Examiner, Art Unit 1615